# APPLIED RESEARCH BRANCH

# Strategic Policy

# Working Paper

Human Resources Development Canada
Développement des ressources humaines Canada

Canada

SP-524-10-02E

103-03737/

**Applied Research Branch**
**Strategic Policy**
**Human Resources Development Canada**

# New Evidence on the Determinants of Training in Canadian Business Locations

**W-02-9E**

**by**
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**September 2002**

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Printed/Imprimé 2002
ISBN: 0-662-33040-4
Cat. No./N° de cat.: MP32-28/02-9E

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# Abstract

The purpose of this paper is to study the determinants of worker and workplace participation in training using data from the 1999 Workplace and Employee Survey (WES). To evaluate the level of commitment of the employer to training, the authors also present an analysis of the proportion of employees trained. In Canada, a number of studies have examined the factors which determine participation in training. However, until recently, no Canadian survey made it possible to simultaneously use a large number of both employee and employer characteristics. The WES is unique in that it gathers detailed and linked data on business locations and their workers, for the whole private non-agricultural sector of the economy, thereby facilitating a more complete analysis than was previously possible. Furthermore, it enables the joint analysis of the determinants of both classroom and on-the-job training and an exploration of the differences and the links between these two types of training.

Most of the results obtained from earlier surveys that contained information on employers or employees solely are confirmed by this study. For example, the authors find that previously acquired human capital plays a significant role for employees in employer-supported training; workers with post-secondary education are more likely than those with lower educational attainment to take classroom training. Furthermore, the correlation between training on the one hand and on the other hand the introduction of technologies or innovation that was found in employer-based surveys remains important in this study.

Among new results, there is the fact that location size has a strong positive impact on the probability that the employer will support training for at least one of its employees, but that this impact is negative or nil on the proportion of employees trained in a location supporting training. Further, the abundance of information on employers makes it possible to bring to light a significant positive correlation between training and the importance attached to business strategies. As for employee characteristics, the positive correlation between technology and training that one can note on the employer side is also reflected on the employee side by the fact that those who use a computer at work are more likely to take training. Also, unlike results from other studies, age doesn't seem to have an important impact on participation in training. Finally, since participation in on-the-job training is more uniform than participation in classroom training, including on-the-job training in training statistics narrows but does not eliminate participation gaps between various groups of workers or businesses.

# Acknowledgements

The authors would like to thank Gilles Bérubé of the Applied Research Branch at HRDC, as well as Marie Drolet of Statistics Canada, for their invaluable comments.

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# 1. Introduction

Rapid and significant changes in technology and intensification of international competition have substantially increased the importance of innovation in economic growth. It is generally recognized that firms that innovate are more profitable, grow more rapidly and create a larger number of jobs. Within a firm, the process leading to innovation requires a high level of human capital among workers. In order to participate fully in this process, workers must not only acquire strong basic knowledge through the education system but also need to have opportunities to acquire training in the labour market. Training taken within the firm could extend the knowledge acquisition process and help workers to renew or adapt previously accumulated skills and enable them to fully contribute to the improvement of productivity or to innovation.[1]

There are different types of training. Some training can be formal and taken at a location other than the workplace, while other training may rely on an informal learning process and take place on the job. Despite a number of studies conducted in Canada, we still have only a limited understanding of the factors influencing the decision to choose between the two-types of training (classroom or on-the-job). In fact, most Canadian studies have focused on the determinants of classroom training. Moreover, they have used surveys collecting data on either firms or households/employees alone. The objective of this paper is to examine the determinants of these two types of training using data from the Workplace and Employee Survey (WES). This new survey is unique in that it gathers detailed and linked data on employers[2] and their employees, thereby facilitating a more complete analysis of the determinants of training than was previously possible. Our research offers several perspectives. First, the analysis is carried out with the help of two indicators of training supplied by the employer (from the employer questionnaire), specifically, incidence and intensity. Incidence refers to the proportion of locations supporting training while intensity is measured by the proportion of trained employees within those firms that support training. The latter analysis enables us to distinguish the characteristics of locations that support training for many workers from those of locations that support training for only a

1 For a review of empirical results showing positive correlations between growth and innovation and between innovation and training, see Baldwin (1999).

2 Employers' questionnaire covers the activities of a particular business location and not of the firm as a whole. We will interchangeably use employer, firm or location even tough we refer to the location, unless otherwise specified.

few workers.[3] Second, training is analysed using needs or aptitudes of workers simultaneously to those of employers. Many detailed variables are used describing behaviour on the labour market of firms (innovation, business strategies, technology use, competition, ...) and employees (hours worked, computer use, temporary status of job, ...). Third, our econometric models jointly analyse the determinants of both classroom and on-the-job training, making it easier to examine the differences and links between these two types of training.

In terms of the determinants of the incidence of training for employers, econometric analyses revealed strong links between innovation, technology, the use of business strategies and the fact that the employer supports training.

The various independent variables generally had similar effects on the supply of classroom and on-the-job training. Further, the employer appears to view these two types of training more as complements than substitutes. For example, small locations do not appear to compensate for their low participation rate in classroom training by a higher participation in on-the-job training.

A comparison of the results of the incidence analysis with those of the intensity analysis shows that the determinants of training intensity are very similar to those of training incidence. However, one major difference between the two analyses is the impact of the size of the location, a variable that appears to have a negative impact on the proportion of employees trained while having a positive impact on the incidence of training. This finding suggests that small locations are affected by the high fixed costs of training, but that those that manage to offer training to their employees train a higher proportion of them than do large locations.

With respect to the determinants of the incidence of training for employees (the proportion of employees receiving training, as reported by employees), the econometric analysis reveals disparities between various segments of workers and confirms a number of findings reported in the literature. Part-time workers, those in non-permanent positions, with little tenure or with a maximum of a secondary school diploma, are among the least likely to participate in classroom training (potentially the most costly type of training). Computer use is linked to greater

[3] Training intensity can also be defined at the employee level as the number of hours of training per participant. This aspect of intensity will not be examined in this paper and could be the subject of further research. In the case of on-the-job training, it is difficult to distinguish training from the job performed. The start and end of training and the number of hours of such training are hard to identify (cf. Lowenstein and Spletzer, 1994).

participation in both classroom and on-the-job training. While there appears to be a strong link between post-secondary education and participation in classroom training, thereby widening the gap between those with the most and those with the least education, there does not appear to be a link between educational attainment and participation in on-the-job training. Thus, including on-the-job training in the analysis narrows the gaps in some cases between the various groups of workers without eliminating them altogether.

This paper is organized as follows. The next section describes the survey used and the types of training examined. It also discusses the benefits offered by the WES. Section 3 contains the main descriptive statistics on training derived from the WES. Sections 4, 5 and 6 contain the econometric models used and our comments on the results of these estimations. Section 7 presents our conclusions and our suggestions for possible future research.

## 2. Workplace and Employee Survey

The data used in this research came from the Workplace and Employee Survey (WES) conducted, for the first time, by Statistics Canada between May and September 1999. The sample of locations was stratified by region, industry and size of the location. The WES covers business locations of all sizes for industries in the private, non-agricultural sector.[4] For each location, a manager answered to the employer questionnaire, in the context of a personal interview. A sample of workers from each location answered to the employee questionnaire, by telephone. The number of employees surveyed varied between three and ten, depending on the number of employees at the location, and employees were selected randomly from a list provided by the location. The survey response rate was 95% for locations and 83% for workers, as 6,322 locations and 23,540 employees answered the questionnaires. Since the WES is a longitudinal survey, it will be repeated for four years with the same locations and for two years with the same workers.

It is possible, with the WES, to analyse the employee data controlling for employer characteristics and changes to the workplace. The WES also contains a wide range of questions.[5] On the employer side, the survey covers the composition of the workforce, vacant positions, human resource practices (compensation structures, work organization, etc), business strategies, innovation and technology, etc. On the employees' side, the WES covers, among other things, the use of technology, training, the terms and conditions of employment, etc. Data normally collected in household surveys (such as age, occupation, education, tenure) are also included in the WES database.

The WES includes several questions on training. The employer questionnaire asks about training supported (i.e., provided, funded or assisted) by the location during the period from April 1, 1998 to March 31, 1999, while the employee survey asks about training taken in the 12-month period prior to the interview. We will focus on two types of training, included in both questionnaires, namely (1) classroom training supported by the employer and (2) on-the-job

4 Locations in the Yukon, Nunavut and the Northwest Territories were excluded, along with locations in the agriculture, fishing, and road, bridge and highway maintenance fields, government services and religious organizations.

5 WES questionnaires are available at the following address: http://www.statcan.ca/english/concepts/wes_e.htm

training supported by the employer (see Appendix 1 for a brief description of the training questions). Classroom training (sometimes called formal training) is defined as training activities with a predetermined format, pre-defined objectives, specific content and progress that can be monitored or evaluated. By definition, on-the-job training is given during work hours and at the workplace (in a location that is not necessarily separate from the "production facilities"). Unlike classroom training, on-the-job training is not defined in the questionnaires. A brief analysis of the characteristics of these two types of training shows major differences in the learning methods.[6] The employer survey provides information on the support for both types of training and on the number of employees involved, if applicable.

There are several advantages to using the WES over other Canadian surveys covering training when examining the determinants of training. First, the 1999 WES is the most recent survey of training.[7] Therefore, using this survey makes it possible to update findings from previous surveys. Further, the results obtained from the 1999 WES are representative at the national level for both locations and workers.

Canadian surveys of households or workers (Adult Education and Training Survey - AETS, International Adult Literacy Survey - IALS) generally access only a relatively small number of employer characteristics. One of the advantages of the WES is the wealth of information it gathers on the employer. This feature of the survey is especially useful when considering the determinants of worker participation in employer-supported training. Such a decision will be influenced not only by the characteristics of the workers and the jobs they hold, but also by the characteristics of the firm in which they work.

Statistics Canada conducted many employer surveys during the 1990's, such as the Survey of Growing Small and Medium-Sized Enterprises, the Survey on the Characteristics of Bankrupt Firms, the Survey of Operating and Financing Practices of New Firms, the Survey of Innovation and Advanced Technology and the Survey of Innovation. However, these surveys contained no information from the employee perspective, their sample was generally relatively small

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6 For example, only 39% of employees who took classroom training did so at the workplace and 71% did so during work hours. On-the-job training is normally acquired in a self-directed manner (7%) or with the assistance of colleagues or supervisors (52%). Classroom training most often occurs with the assistance of an external or internal instructor (86%).

7 At the time this paper was prepared, only data from the first year of the WES (1999) were available.

representing only a specific part of the economy (SME, new firms, ...), and questions on training were often limited to classroom training. This type of training is not the only tool available to acquire new knowledge. Several economists have recently raised the possibility that acquisition of such knowledge may be accomplished instead through on-the-job training for certain groups of workers and firms. For example, since it would not be necessary to rent facilities or pay an instructor, on-the-job training can be a less costly way to provide training for small firms. Also, for production workers or those with little tenure, on-the-job training given "during production time" might be a more appropriate way to perfect or acquire new skills. Such training may also be a way to overcome the low participation rates reported for certain groups in surveys that cover only formal training. Although most researchers agree on the potential importance of on-the-job training in developing worker skills, few surveys enable us to analyse this aspect at a national level. Because the WES covers both classroom and on-the-job training, we are able to examine the links between these two types of training.

Finally, the 1995 Workplace Training Survey (WTS) asked questions on training to around 2,500 locations, of which about 1,000 had been surveyed two years before. Questions asked to the 2,500 locations were less numerous than in the WES. Also, 18 locations were followed more thoroughly and their responses were linked to responses from roughly 400 employees of these locations. The number of observations for which we had linked data was thus very limited.

# 3. Descriptive statistics from the WES

In this section, we present the main findings of the WES regarding training based on the employer and employee surveys. These findings are compared to those of previous Canadian surveys. However, since there are several significant differences between these surveys and the WES (reference period, definition of training, sample, etc.), comparing assessed proportions of locations supporting training or proportions of trained employees is difficult.

## 3.1 Proportion of locations supporting training

Table 1 shows the proportion of locations supporting training by size, industry, province and the presence of an innovation or introduction of a new technology in a location. Slightly more than half of the locations (54%) in the private, non-agricultural sector supported training for their employees. It is not surprising that support for on-the-job training (45%) is higher than for classroom training (31%). Locations may support only one type of training or both types. Among locations that decided to support training, 17% supported only classroom training, 42% supported only on-the-job training and 41% supported both types of training.

These participation rates are considerably lower than those reported in the 1995 Workplace Training Survey. Betcherman et al. (1997) reported that about 70% of establishments, representing 90% of the jobs covered by the survey, supported formal or informal training. The participation rate of establishments in formal training was 42%. We should remember, however, that the WES deals with locations and it is therefore not surprising that the participation rates in the WES are lower than those of surveys that covered establishments or firms, which on average have more employees.[8] Baldwin and Johnson (1995) reported that 59% of growing SMEs provided formal or informal training, based on the 1992 Survey of Growing Small and Medium Sized Enterprises. Formal training was supported by 44% of firms, while 40% supported informal training.

Table 1 shows that the proportion of locations supporting training increases with the number of employees at a location, for both classroom and on-the-job training. However, the differential between small and large locations is smaller for on-the-job training than for classroom training.

[8] For example, the 1995 WTS shows 32% of establishments with 100 or more employees, while the WES shows only 2% of locations with 100 or more employees (weighted data).

The finance and insurance, and communication and other utilities sectors have the largest proportions of locations supporting training, while the real estate services and construction sectors have the lowest. The data show that Quebec has the largest proportion of locations supporting classroom training among all other provinces. However, Quebec ranks behind Ontario, Manitoba, Saskatchewan, British Columbia and Alberta for on-the-job training. The proportion of locations supporting training is higher among those which innovated or introduced a new software or technology, for both types of training.

Table 1 **Proportion of locations supporting training, by location characteristics**

| | *Classroom (1)* | *On-the-job (2)* | *Ratio (1)/(2)* | *Total* |
|---|---|---|---|---|
| **Size of business location** | | | | |
| Fewer than 20 employees | 26 | 40 | 0.65 | 49 |
| Between 20 and 49 employees | 62 | 81 | 0.77 | 89 |
| Between 50 and 99 employees | 77 | 84 | 0.92 | 93 |
| 100 or more employees | 85 | 89 | 0.96 | 97 |
| **Industry** | | | | |
| Natural resources exploitation | 34 | 39 | 0.86 | 50 |
| Manufacturing | 34 | 51 | 0.66 | 59 |
| Construction | 24 | 37 | 0.64 | 43 |
| Transportation, storage, wholesale trade | 33 | 46 | 0.70 | 53 |
| Communication and other utilities | 42 | 54 | 0.78 | 64 |
| Retail trade and commercial services | 25 | 47 | 0.53 | 54 |
| Finance and insurance | 59 | 64 | 0.93 | 78 |
| Real estate, rental, leasing operations | 19 | 27 | 0.72 | 34 |
| Business services | 29 | 40 | 0.71 | 49 |
| Education and health services | 40 | 41 | 0.95 | 57 |
| Information and cultural industries | 37 | 53 | 0.70 | 62 |
| **Region** | | | | |
| Atlantic | 23 | 35 | 0.65 | 41 |
| Quebec | 35 | 35 | 0.99 | 49 |
| Ontario | 33 | 50 | 0.65 | 58 |
| Prairies | 31 | 48 | 0.65 | 57 |
| British Columbia | 27 | 49 | 0.54 | 57 |
| **Innovation** | | | | |
| Has innovated | 42 | 58 | 0.73 | 68 |
| Has not innovated | 21 | 33 | 0.63 | 42 |
| **Technology** | | | | |
| Has introduced a technology / software | 46 | 60 | 0.77 | 70 |
| Has not introduced a technology / software | 25 | 39 | 0.64 | 48 |
| **Total** | **31** | **45** | **0.69** | **54** |

## 3.2 Proportion of trained employees by location, reported by employers

As for the intensity of training, Table 2 shows that on average locations offering training support a large proportion of their workforce: 63% for classroom training and 66% for on-the-job training. Contrary to what one might have assumed, classroom training does not appear to be a more selective form of training than on-the-job training.

There are very few surveys that can be used to compare the WES findings in terms of percentage of workers trained. The Baldwin and Johnson (1995) study, for example, reveals much lower percentages of employees trained for formal (31%) and informal training (41%) than those reported in the WES.

Table 2 **Proportion of trained employees by location offering training, by location characteristics**

| | *Classroom (1)* | *On-the-job (2)* | *Ratio (1)/(2)* |
|---|---|---|---|
| **Size of business location** | | | |
| Fewer than 20 employees | 67 | 69 | 0.97 |
| Between 20 and 49 employees | 51 | 56 | 0.90 |
| Between 50 and 99 employees | 55 | 54 | 1.02 |
| 100 or more employees | 52 | 46 | 1.12 |
| **Region** | | | |
| Atlantic | 59 | 71 | 0.83 |
| Quebec | 59 | 54 | 1.10 |
| Ontario | 62 | 67 | 0.93 |
| Prairies | 68 | 75 | 0.91 |
| British Columbia | 65 | 62 | 1.04 |
| **Innovation** | | | |
| Has innovated | 61 | 67 | 0.92 |
| Has not innovated | 65 | 64 | 1.02 |
| **Technology** | | | |
| Has introduced a technology / software | 65 | 67 | 0.96 |
| Has not introduced a technology / software | 61 | 65 | 0.95 |
| **Total** | **63** | **66** | **0.95** |

Table 2 also shows that the proportion of trained employees diminishes with the size of the location, mostly for on-the-job training. For classroom training, size doesn't seem to be important beyond 20 employees. Quebec is the region in which the proportion of employees trained on the job is the smallest, while the Prairies have the highest proportion of trained employees in each training category. Finally, innovation and the introduction of a technology don't seem to greatly influence the proportion of employees trained in locations offering training.

## 3.3 Proportion of employees taking training, reported by employees

Table 3 shows participation rates (proportion of employees taking training) in classroom and on-the-job training, as reported by employees. Slightly more than half of those employees (55%) received at least one training period. The participation rate in classroom training (37%) is slightly higher than that in on-the-job training (30%). Few employees (12%) received both classroom and on-the-job training during the year. One-quarter (25%) of employees took only classroom training, while 18% took only on-the-job training.

The results of the 1998 AETS indicate lower participation rates for classroom training than those obtained in the WES. According to the AETS, approximately one-third (32%) of salaried individuals took training (courses or programs) related to their present job or to a future job. The majority (83%) of this training was supported by the employer, although 36% of the employees trained paid for their training, in whole or in part (or with help from their family). Thus, the participation rate in job-related classroom training supported by the employer is 26% in the 1998 AETS compared with 37% in the WES. The findings of the 1998 New Approaches to lifelong learning (NALL) survey show that 65% of adults, whether salaried or not, participated in informal training. The definition of informal training in the NALL survey is much broader, however, than that of on-the-job training in the WES.

Table 3 also shows that the proportion of part-time employees (those working less than 30 hours per week) taking classroom training is lower than for full-time employees. However, a high number of hours worked (more than 50 hours) reduces the availability for training (mainly for on-the-job training). Participation by type of training varies widely by occupation. Managers, professionals and technical workers are more likely to take classroom training than on-the-job training. The opposite result applies to business and sales staff and unskilled production workers. Administrative personnel will take either classroom or on-the-job training. The existence of a collective agreement appears to play a major role in the case of classroom training only, favouring the participation of employees covered by the agreement. Participation in on-the-job training occurs mainly in the first year of a job and gradually decreases thereafter.

Table 3 **Proportion of employees taking training reported by employees, by characteristics of employees and locations**

| | *Classroom (1)* | *On-the-job (2)* | *Ratio ((1)/(2))* | *Total* |
|---|---|---|---|---|
| **Hours worked** | | | | |
| Less than 30 hours / week | 25 | 31 | 0.83 | 47 |
| Between 30 and 50 hours / week | 39 | 30 | 1.30 | 56 |
| 50 hours / week or more | 37 | 26 | 1.40 | 52 |
| **Employment status** | | | | |
| Permanent | 38 | 30 | 1.26 | 56 |
| Non permanent | 24 | 25 | 0.96 | 43 |
| **Occupation** | | | | |
| Manager | 44 | 30 | 1.48 | 61 |
| Professional | 54 | 34 | 1.57 | 68 |
| Technical / trades | 35 | 27 | 1.29 | 51 |
| Marketing / sales | 21 | 28 | 0.75 | 43 |
| Clerical / Administrative | 32 | 34 | 0.94 | 55 |
| Unskilled production worker | 24 | 31 | 0.77 | 45 |
| **Use of computer at work** | | | | |
| Uses computer | 45 | 35 | 1.30 | 64 |
| Does not use computer | 24 | 23 | 1.08 | 41 |
| **Covered by collective agreement** | | | | |
| Covered | 41 | 31 | 1.34 | 58 |
| Not covered | 35 | 30 | 1.19 | 53 |
| **Tenure with employer** | | | | |
| Less than 1 year experience | 26 | 36 | 0.72 | 55 |
| 1 to 4 years experience | 35 | 34 | 1.03 | 57 |
| 5 to 9 years experience | 38 | 27 | 1.42 | 52 |
| 10 to 19 years experience | 40 | 26 | 1.54 | 55 |
| 20 years experience or more | 38 | 27 | 1.43 | 53 |
| **Educational attainment** | | | | |
| No high school diploma | 21 | 23 | 0.93 | 40 |
| High school diploma | 28 | 29 | 0.98 | 48 |
| Certificate | 36 | 26 | 1.37 | 51 |
| College diploma | 38 | 32 | 1.17 | 57 |
| University degree | 49 | 33 | 1.50 | 64 |
| **Gender** | | | | |
| Male | 37 | 28 | 1.29 | 53 |
| Female | 37 | 31 | 1.18 | 56 |
| **Age** | | | | |
| 15-24 years | 24 | 39 | 0.61 | 53 |
| 25-34 years | 40 | 31 | 1.29 | 58 |
| 35-44 years | 40 | 31 | 1.27 | 57 |
| 45-54 years | 38 | 28 | 1.37 | 53 |
| 55 years and + | 31 | 19 | 1.64 | 42 |
| **Size of business location** | | | | |
| Fewer than 20 employees | 26 | 24 | 1.09 | 44 |
| Between 20 and 49 employees | 31 | 30 | 1.03 | 51 |
| Between 50 and 99 employees | 37 | 39 | 0.97 | 59 |
| 100 or more employees | 48 | 32 | 1.48 | 64 |

**Table 3** (continued)

| | *Classroom (1)* | *On-the-job (2)* | *Ratio ((1)/(2))* | *Total* |
|---|---|---|---|---|
| **Industry** | | | | |
| Natural resources exploitation | 43 | 30 | 1.43 | 62 |
| Manufacturing | 35 | 31 | 1.11 | 53 |
| Construction | 28 | 26 | 1.09 | 43 |
| Transportation, storage, wholesale trade | 39 | 29 | 1.37 | 55 |
| Communication and other utilities | 52 | 33 | 1.60 | 66 |
| Retail trade and commercial services | 23 | 28 | 0.81 | 45 |
| Finance and insurance | 59 | 43 | 1.35 | 75 |
| Real estate, rental, leasing operations | 30 | 21 | 1.44 | 44 |
| Business services | 44 | 28 | 1.55 | 59 |
| Education and health services | 45 | 31 | 1.48 | 61 |
| Information and cultural industries | 39 | 30 | 1.31 | 56 |
| **Region** | | | | |
| Atlantic | 33 | 28 | 1.21 | 51 |
| Quebec | 36 | 18 | 2.01 | 47 |
| Ontario | 40 | 35 | 1.17 | 60 |
| Prairies | 37 | 35 | 1.04 | 59 |
| British Columbia | 30 | 32 | 0.92 | 51 |
| **Innovation** | | | | |
| Has innovated | 40 | 32 | 1.23 | 58 |
| Has not innovated | 32 | 26 | 1.24 | 48 |
| **Technology** | | | | |
| Has introduced a technology / software | 40 | 33 | 1.23 | 59 |
| Has not introduced a technology / software | 34 | 28 | 1.24 | 51 |
| **Total** | **37** | **30** | **1.23** | **55** |

Participation in classroom training is much more uniform across tenure levels and peaks among workers with five to 10 years' tenure. There are also significant differences in participation depending on the personal characteristics of the workers. Training participation, whether classroom or on-the-job, increases with the level of education achieved. However, the differential between the various levels of education is smaller for on-the-job training than for classroom training. The rate of participation in classroom training peaks at 40% between 25 and 44 years of age and gradually declines thereafter. Workers between the ages of 15 and 24 years have the highest participation rate (39%) in on-the-job training among all of the age groups. This participation rate declines after that.

As with the location data, the participation rate of employees in training increases with the size of the location. However, this phenomenon may reflect the greater access of employees in larger locations to training rather than greater participation by these workers. The participation rate of employees in classroom training is higher than for on-the-job training for the vast majority of

sectors in which the employees work. However, in the manufacturing industries, on-the-job training accounts for a significant share of the total training taken by employees. Based on the employee data, the Prairie provinces and Ontario support training for a larger number of workers, followed by British Columbia, the Atlantic provinces and finally Quebec. However, employees in Quebec appear to devote a much larger share of their training to classroom training than do employees in the other provinces. Finally, innovation and the introduction of a new technology in a location appear to slightly increase employee participation rates in training.

## 3.4 Comparison of employers and employees responses

Table 4 compares results from the two questionnaires. As we have seen, 54% of locations supported training for their employees. These locations accounted for 85% of total employment. Knowing that 55% of employees reported taking training, we can thereby identify two separate groups of non-participants. The first group of non-participants is composed of the 29% of workers with possible access to training but who did not take it either because of a lack of demand on their part or because of a selection process carried out by the employer. For example, if the return on training increases with the level of education achieved, the employer may decide to support training for the more educated workers only or the more educated workers may be more inclined to ask for training support. The second group of non-participants consists of the 16% of employees working in a location that didn't offer training to any of their employees.

Table 4 **Descriptive statistics, Workplace and Employee Survey, 1999**

| | Employer questionnaire | | | Employee questionnaire |
|---|---|---|---|---|
| | Proportion of locations offering training | Share of employment held by locations offering training | Proportion of trained employees by location offering training | Proportion of employees taking training |
| Classroom or on-the-job training | 54% | 84% | - | 55% |
| Classroom training | 31% | 67% | 63% | 37% |
| On-the-job training | 45% | 75% | 66% | 30% |

We can also see that if locations offering classroom training represent 67% of total employment and that they train 63% of their employees on average, then there should be 42% taking classroom training. The same calculation for on-the-job training produces a figure of 50% of employees trained on-the-job. However, 37% of employees reported taking classroom training and 30% did so for on-the-job training. These differences can be explained in part because, as

seen, large locations train a slightly lower proportion of employees than smaller locations, particularly in terms of on-the-job training. Response errors and differences in the interpretation by employees and employers as to what constitutes on-the-job training could also be among the factors explaining this result.

The next sections will examine the factors which determine participation in classroom and on-the-job training for employers and employees. Three econometric analyses are presented. The first outlines the proportion of employers supporting training. The second looks at the proportion of employees trained by location offering training, and the third deals with the participation of workers in training, according to answers of employees to training questions. For each of the analyses we describe the econometric model used, the independent variables, and the findings.

# 4. Determinants of participation by locations in training

## 4.1 Econometric model

The sample used consists of the 6,322 locations that completed the employer questionnaire.[9] We used a bivariate probit model to estimate the determinants of the incidence of classroom and on-the-job training. The advantage of this model is that it is able to take into account the fact that locations can combine support for classroom and on-the-job training. The decision of the employer to support classroom training and that to support on-the-job training can be correlated for several reasons. In particular, this correlation may be positive if there are complementary links between the two decisions, reflecting a common decision to invest in human capital, for example. On the other hand, the correlation may be negative if the two types of training are mainly substitutes. This could occur if there are differences in the cost of the two types of training. Usually, classroom training is more expensive than on-the-job training.

Consider the following formal model:

(1) $Y_{si}^{*} = \beta_{si} X_i + \mu_{si}$

(2) $Y_{si} = 1$ if $Y_{si}^{*} > 0$; $Y_{si} = 0$ otherwise.

$Y_{si}^{*}$ is the usefulness or benefit that location $i$ perceives in offering classroom training $s$. Although this usefulness is a latent, unobserved variable, we can determine whether or not the location offers classroom training. In other words, the location supports the training ($Y_{si}$=1) if the usefulness of offering classroom training is positive ($Y^{*}_{si}$>0). If it is not positive, the location does not support the training. The $X$ variables are independent variables explaining the decision of the locations.

[9] Note that 2,505 additional locations were declared to be "out-of-scope" for various reasons (location closed, impossible to contact, etc). Unless non-random selection is used for training, the exclusion of these observations from the sample does not affect the estimation of the parameters but could bias the variance estimates. All estimations were carried out taking into account a number of survey corrections. For example, we built models that included the "out-of-scope" locations, by correcting for the stratification of locations (region/industry/size) and for the fact that there was a finite sample of employers. The estimated variances differ at the third and fourth decimal only. Given that several econometric models in STATA do not allow for the use of these options, we have chosen to present the models without these corrections.

Similarly, the following equations model the decision of the location $i$ to offer or not to offer on-the-job training $e$:[10]

(3) $Y_{ei}^{*} = \beta_{ei} X_i + \mu_{ei}$,

(4) $Y_{ei} = 1$ if $Y_{ei}^{*} > 0$, $Y_{ei} = 0$ otherwise.

Note that we use the same independent variables for both types of training. However, the influence of these variables (measured by $\beta$) on the probability of offering or not offering training can vary by type of training. The residuals $\mu_{si}$ and $\mu_{ei}$ have a joint normal distribution. By using a joint density function for the residuals, we can estimate a coefficient of correlation between them. This is one way to link the estimation of the two equations and to recognize the simultaneous nature of the training decisions of locations.[11] This model is estimated by maximum likelihood method. Note that if both types of training are offered, they can be considered as complements for the location, while if only one of the two is offered, they could potentially be substitutes.

## 4.2 Independent variables

In the human capital model developed by Becker in 1964, training is seen as an investment decision. Firms invest in training to increase productivity or to retain workers, for example, and workers undertake training in order to move up the wage scale faster or to improve their mobility. Thus, an investment in training will be made only if the expected benefits (monetary and non-monetary) are enough to offset the costs incurred and if the rate of return is considered "adequate".

Given that the benefits of training are realized after a period of time, considerable attention has been given to the distribution of training costs between firms and workers. According to Becker's model, firms will not cover the costs of "general" training.[12] In fact, the investment

[10] For an informal training model applied to Canadian data, see Chennouf, Lévy-Garboua and Montmarquette (1997).

[11] In this type of discrete variable model (0-1), problems of logic consistency (see Maddala, 1983) make it difficult to express direct simultaneity of decisions (one decision based on the other, for example, and vice versa). This issue could be the subject of further research.

[12] According to Becker's model, general training enables workers to acquire skills that are fully transferable, thereby increasing the productivity of the trained worker in the same way in all firms. Purely specific training enables workers to acquire skills that are not transferable to other firms, thereby increasing the worker's productivity only for the firm that provided the training.

cannot be made cost-effective for the training firm because the latter cannot pay the individuals trained below their marginal productivity since they can obtain a higher wage in other firms.[13] Training costs can be financed, however, by the firm when the training is "specific" in nature since the trained workers are not able to receive a better wage by changing jobs. In order to minimize the losses caused by the voluntary departure of workers and layoff decisions by firms, the return on investment and, consequently, the costs of specific training, will be shared by the workers and the firm.

The human capital theory provides guidance in our choice of independent variables. To make the analysis easier, the independent variables are placed into three major categories: "competitive and strategic variables," "structural variables" and "workforce characteristics". Appendix 2 contains a more detailed explanation of the independent variables used in our econometric analyses.

### 4.2.1 Competitive and strategic variables

***Innovation and technology***

To adjust the qualifications of their workers to those required for innovation and the use of new technologies, firms can train their existing workers or they can hire new workers with the necessary skills. When the necessary knowledge is very specific or change is occurring quickly, it may be better to train the existing workers.

Baldwin (1999) reviews a number of Canadian studies establishing a positive link between innovation or technology and training. For example, Baldwin, Gray and Johnson (1996) report that establishments in the manufacturing sector which introduce advanced technologies experience an increase in their skill requirements as a result. Wannell and Ali (2002), using WES data, show that employees working in a firm that introduces a new technology or software are more likely to receive either classroom or on-the-job computer-related training. Baldwin and Lin (2001) indicate that, among five types of impediments to the adoption of advanced

[13] Empirically, several studies (Barron, Black and Lowenstein (1989), Bishop (1991) and Loewenstein and Spletzer (1998)) have shown that trained workers do not appear to support the cost of general training through a lower salary. They also show that the impact of training on salary is less than the impact on productivity, suggesting that firms recover part of the return of general training. In order to explain these empirical findings more effectively, several economists (Katz and Ziderman, 1990; Acemoglu and Pischke, 1998 and 1999; Stankiewicz, 1995; Stevens, 1994) recently relaxed some of the strong hypotheses of the Becker model, such as the hypothesis of perfect competition in the labour market.

technologies (cost-related, institutional, labour-related, organizational, and information related), the labour-related type of impediments (skill shortage, training difficulty, and labour contract) comes second to that related to costs, according to the employer. As for the link between innovation and training, Baldwin and Johnson (1996) find that innovative firms train a higher proportion of their workers, both formally and informally. Moreover, Baldwin (2000) highlights the importance of innovation and skills (and indirectly, training) in the success of new firms. Finally, Rao, Tang and Wang (2002) find that firms using government programs for training are more likely to be innovative.

In order to test relationships between training, innovation and technology, we used two dichotomous variables. The first variable shows whether the location upgraded or introduced new products and services or processes. The second variable indicates whether the location installed major new software or new hardware, computer-run or computer-assisted technology or other technologies or machines on a large scale.

***Business strategies***

The decision to support training depends on the recognition of the strategic importance of the human resources to the firm. Bartel (1991) found, for example, that firms that actively planned their human resources were more likely to propose training. In the WES, locations were required to indicate the relative importance of fifteen business strategies covering research and development (R&D), human resources, product quality and cost reduction. Because several of these strategies can be complementary, we used a cluster analysis to divide the locations into five separate groups. The cluster analysis methodology used is provided in Appendix 3. From these five groups, we built five dichotomous variables named to reflect the importance given to the various strategies.[14] It is expected that locations for which human resource strategies are important (i.e., locations in the "all strategies" and "all strategies except R&D" groups) will be more likely to support training than those with "no strategy". Further, locations that view R&D strategies as being very important will be more likely to propose training, given the complementarity between training and research.

[14] The variables are as follows: "No strategy," "Cost reduction strategies only," "R&D strategies only," "All strategies except R&D," "All strategies".

***Competition***

In order to measure the impact of competition on participation in training, we used several dichotomous variables to capture the source of the competition and its intensity. Since this information is available for profit-based locations only, we used a binary variable to indicate whether or not the location is a non-profit firm.

### 4.2.2 Structural variables

***Size and industry***

A location's participation in training will be influenced by its structure and by the characteristics of the industry sector in which it operates. For example, previous studies have shown a positive association between the location's size and the decision to invest in training. Economies of scale (Barron et al., 1987), better access to capital at beneficial rates (Hashimoto, 1979) and a greater capacity to absorb the costs associated with the turnover of trained workers (Holtmann and Idson, 1991) would make it easier for large firms to finance training. Differences in the market conditions for products/services (fluctuation in demand, for example), profitability or the technologies used can impact the costs and benefits of training in the various industries. We use the logarithm of the number of employees and dichotomous variables for industry to capture these effects. We also take into consideration the fact that the employer may belong to a firm with several locations. We will use the expression "multi-location" to indicate that the location is part of such a firm.[15]

***Region***

At the region level, many studies (Baldwin and Johnson, 1995; Betcherman et al., 1997; Jennings, 1996) have identified differences in participation rates among both employers and individuals in the various regions of Canada. These disparities may reflect differences in workforce composition or in labour market conditions. They may also be caused by differences at the institutional level, such as, different provincial public policy.

In recent years, an important event has affected decisions by Quebec employers regarding investment in training. Since 1998, the *Act to Foster the Development of Manpower Training*

[15] This information is not available from the survey; it comes from administrative data provided by Statistics Canada.

(Bill 90) has been in full force and has required firms with payrolls exceeding $250,000 to invest in training an amount equal to at least 1% of their payroll.[16] The purpose of this legislation is to instil a training culture in Quebec while at the same time raise the qualifications of the labour force.

Our study strives to isolate the potential impact of this legislation on investment in training by Quebec locations compared with locations in other provinces. To this end, we introduced, in addition to the usual dichotomous variables for each of the regions (Atlantic provinces, Quebec, Ontario, Prairies and British Columbia), a variable that identifies locations in Quebec with payrolls equal to or exceeding $250,000. Obviously, Quebec is not the only province with training incentives (tax credits, financial and non-financial assistance, etc.), but Quebec is the only province to have legislation requiring firms to invest a certain amount in training and the WES enables to clearly identify the locations affected by this Act.

***Unionization***

It is unclear what the theoretical effect of unionization is on participation in training. In the case of general training (i.e., likely to benefit all firms), the base salary of a unionized worker may be too high for the location to offer training for which it would have to pay entirely since it would be unable to ask the worker to assume the costs through a lower salary. However, Acemoglu and Pischke (1998, 1999) suggest that unionization, or any other imperfections of the labour market that contribute to reducing the distribution of wages, may encourage firms to fund general training because it increases the cost for workers to move to other firms. Moreover, unions can also encourage employer's investment in training by improving communications between the parties and reducing employee turnover (Freeman and Medoff, 1984). Most studies use a dichotomous variable to show whether or not there is a union or collective agreement present. In our case, we added a variable indicating whether an agreement had been reached regarding education and training between the largest bargaining unit and the location. Adding this variable makes it easier to identify the impact attributable to the presence of a union in the location and that attributable to the presence of provisions relating to training in the collective agreement.

16 See the Emploi Québec (1998) document for more information.

### 4.2.3 Workforce characteristics

We also used a number of variables linked to the workforce employed by the location.[17] Results of other worker surveys have shown that professionals and permanent full-time workers are generally more likely to take formal training. We used several variables measuring the percentage of the workforce in each profession and the proportion of non-standard workers[18] to capture the effect of these factors. Given that the weaker stability of so-called "non-standard" workers can reduce the potential benefits of training for the employer, we anticipate that a large proportion of non-standard workers in a location will reduce the likelihood that the location will support training.

By using a variable that measures payroll per employee, we are able to take into account certain wage disparities resulting from differences in the average tenure of workers, average level of education or the profitability of the firm. We expect that the level of the payroll per employee will have a positive effect on the likelihood of supporting training.

A firm's turnover rate can be linked to training for several reasons. When there is high turnover, firms may be motivated to support training in order to increase worker retention. In addition, a high turnover rate means new employees must be hired, who may, for a period of time, have higher training needs. However, when turnover reaches a certain level, it may be very expensive for companies to train their employees because they may not get the return on their investment. In order to take these two effects into account, we used the turnover rate and the turnover rate squared.

Vacant positions may result from frictional or organizational factors. For example, the qualifications of those seeking employment may not correspond to those required by the employer. In these circumstances, a high proportion of vacant positions may encourage firms to invest more in existing workers. Positions may also be vacant because of problems in retaining or recruiting workers. In these circumstances, firms may support training to attract more job applicants and to improve retention of existing workers. It should be noted, however,

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[17] We could also have used data from the employee questionnaire (proportion of women, distribution by level of education and tenure, etc.). See Hamermesh (1999) and Abowd and Kramarz (1999) for a more comprehensive discussion of econometric analysis using linked data.

[18] Workers are considered non-standard if they work part time and/or are not permanent employees.

that if there is a very high proportion of vacancies, it may be difficult to train workers, the costs in terms of lost production and the problems in replacing workers being trained being too high. We use the proportion of vacant positions and the square of this proportion as variables to capture these effects.

## 4.3 Findings

The descriptive statistics for the variables used are shown in Table 5. Table 6a shows the marginal effect of each independent variable on the probability that the location offers training (incidence) as well as the probability that this effect is equal to zero. Table 6b presents the predicted probability that the location offers training, calculated at various values of some of the continuous explanatory variables. This was done in order to make it easier to understand the effects of these continuous variables, given that they are implemented in logarithmic or quadratic forms.The estimated coefficient of correlation between the residuals (which can represent unobserved characteristics of the employers) of the incidence equations for classroom and on-the-job training is positive (0.357) and significant (standard-error in parentheses). Thus, employers supporting classroom training are also more likely to support on-the-job training and vice versa. Therefore, these two types of training appear to be more complements than substitutes. It should be remembered that the analysis of the descriptive statistics revealed that a large percentage of locations supported classroom training in combination with on-the-job training.

The analysis shows the complementarity of technology and innovation with worker training. For both classroom and on-the-job training, innovation in products, services and processes, and implementation of new technologies or new software are variables that are positively associated with support for training. When a location introduces an innovation, the probability that it also sponsors training increases by about seven percentage points for each type of training, relative to non-innovative locations. The difference between firms that introduce a new technology and those who not doing so is approximately ten percentage points. A close link between technological incidence and training has also been reported in numerous studies (Statistics Canada, 2001; Bartel, 1998; Betcherman et al., 1997; Mincer, 1989). Training therefore appears to be a key tool in adjusting workforce skills.

Table 5 **Descriptive statistics of variables used, regression models for employers**

| **Dependent variables** | | **Mean** | **Standard deviation** |
|---|---|---|---|
| *Incidence – Classroom training* | Proportion of locations supporting classroom training | 0.312 | - |
| *Incidence – On-the-job training* | Proportion of locations supporting on-the-job training | 0.451 | - |
| *Intensity – Classroom training** | Percentage of workers trained*100 | 62.719 | 1.646 |
| *Intensity – On-the job training*** | Percentage of workers trained*100 | 65.741 | 1.309 |
| *Intensity – Classroom training** | Ln (%of workers trained*100) | 3.903 | 0.039 |
| *Intensity – On-the job training*** | Ln (% of workers trained*100) | 3.980 | 0.026 |
| **Independent variables** | | | |
| **Competitive and strategic variables** | | | |
| *Innovation* | Introduction or improvement of goods or services / processes | 0.480 | - |
| *Technology* | Installation of new software / technologies | 0.287 | - |
| *Business strategies* | Cost reduction strategies only | 0.150 | - |
| | All strategies except R&D | 0.273 | - |
| | All strategies | 0.067 | - |
| | R&D strategies only | 0.257 | - |
| | No strategy | 0.253 | - |
| *Non-profit* | Location is non-profit | 0.088 | - |
| *Sales market* | Sells mostly in local market | 0.882 | - |
| | Sells mostly in Canadian market | 0.081 | - |
| | Sells mostly in international market | 0.037 | - |
| *Number of competitors* | No competitor | 0.152 | - |
| | Between 1 and 5 competitors | 0.281 | - |
| | Between 6 and 20 competitors | 0.238 | - |
| | More than 20 competitors | 0.329 | - |
| **Structural variables** | | | |
| *Size* | Ln (number of employees) | 1.673 | 0.025 |
| | Number of employees | 15.009 | 0.284 |
| *Multi-location* | Belongs to a multi-location | 0.164 | - |
| *Industry* | Natural resources exploitation | 0.018 | - |
| | Manufacturing | 0.077 | - |
| | Construction | 0.080 | - |
| | Transportation, storage, wholesale trade | 0.124 | - |
| | Communication and other utilities | 0.014 | - |
| | Retail trade and commercial services | 0.326 | - |
| | Finance and insurance | 0.051 | - |
| | Real estate, rental, leasing operations | 0.038 | - |
| | Business services | 0.110 | - |
| | Education and health services | 0.140 | - |
| | Information and cultural industries | 0.022 | - |
| *Region* | Atlantic | 0.087 | - |
| | Quebec | 0.217 | - |
| | Ontario | 0.363 | - |
| | Prairies | 0.189 | - |
| | British-Columbia | 0.144 | - |

**Table 5** (continued)

| Independent variables | | Mean | Standard deviation |
|---|---|---|---|
| *Quebec Training Act* | Location subject to the Quebec Act | 0.058 | - |
| *Government* | Use of government assistance for training | 0.076 | - |
| *Unionization* | No employees covered by a collective agreement | 0.925 | - |
| | At least one employee covered / no training agreement | 0.030 | - |
| | At least one employee covered / training agreements | 0.045 | - |
| **Workforce characteristics** | | | |
| *Payroll* | Ln (payroll per employee) | 9.987 | 0.016 |
| *Non-standard jobs* | Percentage of non-standard jobs | 0.292 | 0.010 |
| *Turnover rate* | Turnover rate | 0.695 | 0.037 |
| | Turnover rate squared | 5.381 | 2.210 |
| *Vacant positions* | Percentage of vacant positions | 0.021 | 0.002 |
| | Percentage of vacant positions squared | 0.006 | 0.001 |
| *Occupational distribution* | Percentage of managers | 0.174 | 0.008 |
| | Percentage of professionals | 0.082 | 0.006 |
| | Percentage of technical / trades workers | 0.134 | 0.008 |
| | Percentage of marketing / sales workers | 0.115 | 0.009 |
| | Percentage of administrative personnel | 0.200 | 0.008 |
| | Percentage of unskilled production workers | 0.208 | 0.010 |
| | Percentage of "other" workers | 0.089 | 0.009 |

Note: Sample weights were used. The sample is comprised of 8,827 business locations, including 2,505 "out-of-scope" locations. Means were calculated from the sample excluding "out-of-scope" observations (6,322 locations) while standard deviations were calculated with "out-of-scope" observations. Furthermore, stratification is taken into account.

* Sample used to calculate the mean is comprised of locations that supported classroom training (3,743 locations).

** Sample used to calculate the mean is comprised of locations that supported on-the-job training (4,145 locations).

Table 6a **Determinants of the incidence of training, employer survey, estimation by bivariate probit, marginal effects**

| | | Classroom training | | On-the-job training | |
|---|---|---|---|---|---|
| | | *Marginal effect* | *Pr.>Chi2* | *Marginal effect* | *Pr.>Chi2* |
| **Competitive and strategic variables** | | | | | |
| *Innovation* | Introduction or improvement of goods or services / processes | 0.062 | 0.036 | 0.075 | 0.037 |
| *Technology* | Installation of new software / technologies | 0.085 | 0.004 | 0.109 | 0.001 |
| *Business strategies* | All strategies except R&D | -0.240 | 0.000 | -0.166 | 0.014 |
| | R&D strategies only | -0.143 | 0.030 | -0.098 | 0.137 |
| | Cost reduction strategies only | -0.332 | 0.000 | -0.142 | 0.052 |
| | No strategy | -0.340 | 0.000 | -0.359 | 0.000 |
| | All strategies | Base | Base | Base | Base |
| *Non-profit* | Location is non-profit | 0.199 | 0.002 | -0.011 | 0.868 |
| *Sales market* | Sells mostly in local market | Base | Base | Base | Base |
| | Sells mostly in Canadian market | -0.023 | 0.514 | 0.007 | 0.911 |
| | Sells mostly in international market | 0.019 | 0.769 | -0.132 | 0.026 |
| *Number of competitors* | No competitor | -0.013 | 0.766 | -0.089 | 0.091 |
| | Between 1 and 5 competitors | 0.002 | 0.951 | -0.094 | 0.042 |
| | Between 6 and 20 competitors | 0.011 | 0.773 | 0.003 | 0.954 |
| | More than 20 competitors | Base | Base | Base | Base |
| **Structural variables** | | | | | |
| *Size* | Ln (number of employees) | 0.120 | 0.000 | 0.121 | 0.000 |
| *Multi-location* | Belongs to a multi-location | 0.112 | 0.016 | 0.022 | 0.662 |
| *Industry* | Natural resources exploitation | 0.169 | 0.042 | 0.001 | 0.987 |
| | Manufacturing | -0.039 | 0.352 | -0.043 | 0.426 |
| | Construction | 0.009 | 0.869 | -0.065 | 0.353 |
| | Transportation, storage, wholesale trade | 0.041 | 0.441 | 0.013 | 0.824 |
| | Communication and other utilities | 0.103 | 0.047 | 0.092 | 0.117 |
| | Retail trade and commercial services | Base | Base | Base | Base |
| | Finance and insurance | 0.248 | 0.000 | 0.123 | 0.075 |
| | Real estate, rental, leasing operations | 0.069 | 0.282 | -0.075 | 0.275 |
| | Business services | 0.030 | 0.587 | -0.026 | 0.689 |
| | Education and health services | 0.152 | 0.006 | 0.049 | 0.426 |
| | Information and cultural industries | -0.016 | 0.763 | 0.056 | 0.408 |
| *Region* | Atlantic | -0.098 | 0.040 | 0.082 | 0.162 |
| | Quebec | Base | Base | Base | Base |
| | Ontario | -0.066 | 0.163 | 0.212 | 0.000 |
| | Prairies | -0.020 | 0.666 | 0.215 | 0.000 |
| | British-Columbia | -0.061 | 0.202 | 0.263 | 0.000 |
| *Quebec Training Act* | Location subject to the Quebec Act | 0.090 | 0.194 | 0.230 | 0.003 |
| *Unionization* | No employees covered by a collective agreement | Base | Base | Base | Base |
| | At least one employee covered / no training agreement | -0.076 | 0.145 | -0.040 | 0.613 |
| | At least one employee covered / training agreements | -0.061 | 0.151 | 0.051 | 0.483 |

**Table 6a** (continued)

| | | Classroom training | | On-the-job training | |
|---|---|---|---|---|---|
| | | *Marginal effect* | *Pr.>Chi2* | *Marginal effect* | *Pr.>Chi2* |
| **Workforce characteristics** | | | | | |
| *Payroll* | Ln (payroll per employee) | 0.090 | 0.003 | 0.042 | 0.234 |
| *Non-standard jobs* | Percentage of non-standard jobs | -0.012 | 0.815 | 0.087 | 0.122 |
| *Turnover rate* | Turnover rate | -0.003 | 0.721 | 0.051 | 0.001 |
| | Turnover rate squared | 0.000 | 0.935 | -0.030 | 0.001 |
| *Vacant positions* | Percentage of vacant positions | 0.010 | 0.016 | 0.020 | 0.000 |
| | Percentage of vacant positions squared | -0.018 | 0.036 | -0.028 | 0.001 |
| *Occupational distribution* | Percentage of managers | -0.117 | 0.266 | -0.110 | 0.303 |
| | Percentage of professionals | Base | Base | Base | Base |
| | Percentage of technical / trades workers | -0.022 | 0.767 | 0.021 | 0.827 |
| | Percentage of marketing / sales workers | -0.106 | 0.208 | 0.149 | 0.168 |
| | Percentage of administrative personnel | -0.201 | 0.004 | -0.033 | 0.707 |
| | Percentage of unskilled production workers | -0.247 | 0.000 | -0.020 | 0.817 |
| | Percentage of "other" workers | -0.104 | 0.191 | -0.034 | 0.731 |
| *Coefficient of correlation* | | | 0.357 (0.054) | | |
| *Log likelihood* | | | -695804.58 | | |
| *Pr.>Chi2* | | | 0.000 | | |
| *Sample size* | | | 6,322 | | |

Note: The marginal effect represents the change in the model's predicted probability that the location is sponsoring training (classroom or on-the-job); for dichotomous variables, it is the change in the predicted probability when switching from the base group to a particular group. For continuous variables, it is the effect of a marginal change, calculated at the mean (see Table 6b for an easier interpretation of the effects of continuous variables).

Table 6b **Determinants of the incidence of training, employer survey, predicted probabilities[1] for chosen continuous variables at different values**

| Variables | Value | Predicted probability (%) | |
|---|---|---|---|
| | | Classroom training | On-the-job training |
| *Number of employees* | **Mean (=5.33 employees)** | **26.0** | **43.7** |
| | 15 employees | 39.8 | 56.4 |
| | 75 employees | 63.2 | 74.4 |
| | 500 employees | 85.1 | 89.2 |
| *Payroll per employee* | $15 000 | 22.8 | 42.2 ns |
| | **Mean (= $21 745)** | **26.0** | **43.7 ns** |
| | $35 000 | 30.5 | 45.7 ns |
| | $50 000 | 34.0 | 47.2 ns |
| *Percentage of non-standard jobs* | 0 | 26.3 ns | 41.2 ns |
| | **Mean (=29%)** | **26.0 ns** | **43.7 ns** |
| | 40% | 25.9 ns | 44.7 ns |
| | 60% | 25.6 ns | 46.4 ns |
| *Turnover rate*[2] | 0 | 26.2 ns | 40.4 |
| | 25% | 26.1 ns | 41.6 |
| | **Mean (=69%)** | **26.0 ns** | **43.7** |
| | 200% | 25.6 ns | 50.5 |
| *Percentage of vacant positions*[2] | 0 | 25.0 | 41.3 |
| | 1% | 26.0 | 43.3 |
| | **Mean (=2.1%)** | **26.0** | **43.7** |
| | 10% | 33.6 | 58.3 |

ns: The marginal effect of this variable on the probability of supporting classroom or on-the-job training is not significant at the 10% level

1 Predicted probabilities are calculated by setting the chosen variables to specific values, while the other independent variables of the model are set to their mean values.

2 We also set the square of this variable to its corresponding value.

This econometric analysis also suggests that business strategy variables are highly influential. Locations placing a great deal of emphasis on all strategies (base group) are much more likely to sponsor training of each type than those with "no strategy," with a difference of about 35 percentage points in each case. The group that places an emphasis on R&D strategies is less likely than the base group to sponsor training (particularly classroom training), but is more likely to do so than the other three groups.

The source of competition and the number of competitors do not appear to have a significant effect on the decision to support classroom training. Only locations with a small number of competitors (zero and between one and five) are less likely to support on-the-job training than locations with more than 20 competitors. These findings tend to confirm the conclusion

expressed by Betcherman et al. (1997) that the risk of poaching trained workers is not a major barrier to the employer's supply of training. Otherwise, non-profit locations are much more likely than other locations to sponsor classroom training (by about 20 percentage points).

As with previous research, we found that the probability of supporting training increases with the size of the location. This effect is common to both types of training, classroom and on-the-job. This seems compatible with the existence of high fixed costs (rental of facilities, hiring of an instructor, etc) for providing training, that small locations may find difficult to finance. Table 6b shows that the probability of sponsoring classroom (on-the-job) training is 26% (44%) when the location has five employees. These probabilities rise to 85% and 89% when the location has 500 employees. Thus, including on-the-job training in the total participation rate cannot eliminate the gaps in participation in classroom training between small and large locations.

In terms of industries, several studies have shown that participation rates vary from one sector to the other. Our results show that locations operating in the finance and insurance sector and in the communication and other utilities sector are more likely to support classroom and on-the-job training than locations in the retail sector. Locations in the education and health services, and in the natural resources exploitation sectors are also more likely to support training than those in the retail sector, but for classroom training only, by about 15 percentage points.

In Quebec, the coefficient linked to the fact that locations are subject to the training legislation is positive for classroom and on-the-job training, which could indicate that this Act has a positive impact on the probability of offering training. However, this impact is only significant for on-the-job training. In addition, relative to Quebec (region omitted), locations in other regions of Canada, except the Atlantic provinces, are more likely to support on-the-job training, while this effect is not significant for classroom training.[19] The econometric results show that the composition of training (classroom vs. on-the-job) varies from region to region.

These findings differ from those reported by other Canadian studies (Betcherman et al., 1997; Baldwin and Johnson, 1995) in which locations in Quebec were less likely to support classroom training than those in other regions (except the Atlantic provinces). However, the data used

[19] Note that when the variable indicating whether the location is subject to the Act is not used, locations in the Atlantic provinces, Ontario and British Columbia are less likely than Quebec to support classroom training. In the case of on-the-job training, the signs of the estimated parameters remain the same (however the values of the parameters are much higher) and are significant.

covered a period in which the legislation was not in full force. One possible explanation of these results is that the distinction between classroom and on-the-job training is somewhat artificial. To be recognized by the Act, the training provided must be qualifying or transferable. The legislation defines qualifying or transferable training as training provided through a *structured process* that enables the worker to master the skills required to carry out his duties or that are recognized in other workplaces. Such training can be given on the job. Thus, for locations subject to the Act, on-the-job training qualifies as so-called classroom training under Quebec legislation and might be reported as such in the WES. This would alter the composition of the training of Quebec locations, inflating the participation rate in classroom training and under-estimating participation in on-the-job training.[20]

The characteristics of the workforce also appear to influence the participation of locations in training. Payroll per employee is positively linked to the most expensive way of providing training, i.e., classroom training. For example, a location with an average payroll per employee of $15,000 has a 23% probability of sponsoring classroom training; this probability rises to 34% if the payroll is $50,000 instead.[21] This probability varies much less with on-the-job training. The probability that a location sponsors on-the-job training rises at a decreasing rate with the turnover rate (the effect is not significant on classroom training). Thus, a high turnover rate may also act as a deterrent to investment in human capital. Empirical literature suggests similar effects, although Betcherman et al. (1997) obtained a negative relationship between the probability of giving classroom training and a firm's turnover rate. The effect of the percentage of vacant positions is positive at a decreasing rate, for classroom as well as on-the-job training. For example, when there is no vacant position, the probability of sponsoring training is 25% for classroom training and 41% for on-the-job training. These probabilities are equal to respectively 34% and 58% when the proportion of vacant positions is 10% instead.

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[20] One way to overcome this problem is to do the same econometric analysis but using total participation in training (results available on demand). In that model, the impact of the variable "location subject to the Act" remains positive and significant but locations in the other regions (except the Atlantic provinces) are more likely than those in Quebec to support training, a result that is similar to the results obtained in surveys prior to the enactment of the Act.

[21] Note that we take into account the proportion of "non-standard workers" (for example, part-time workers). Therefore, the positive impact of the mean payroll per employee doesn't result from the presence of a higher proportion of full-time workers in the locations with a higher mean payroll per employee.

The econometric analysis reveals that the likelihood of offering classroom training decreases with the percentage of managers, administrative staff, and unskilled workers compared with the percentage of professional workers. This means that a high percentage of professionals appears to favour the location's participation in classroom training. However, except for the percentage of managers (negative influence), distribution by occupation does not appear to have significant impact on the incidence of on-the-job training.

To sum up, many location's characteristics have a high influence on the probability that it will provide classroom and on-the-job training, such as its size, the importance attached to some business strategies as well as the introduction of an innovation or of new technologies. Some characteristics, such as the non profit purpose of the location, the average payroll per employee and the fact that the location is part of a firm which encompasses many locations, have a positive effect on the probability of sponsoring classroom training, whereas other characteristics, such as turnover rate or the proportion of vacant positions, especially have an impact on the probability of sponsoring on-the-job training. There are also differences according to other characteristics, such as region, industry and occupational distribution.

# 5. Determinants of the proportion of employees trained

The proportion of locations supporting training gives an incomplete measure of training effort because it only evaluates the degree of commitment of the firm to investing in training. For example, when the purpose is to examine the impact of training on the firm's productivity, it is not just the fact that the firm supports training that is important but rather the amount of funds committed to it. Moreover, in some studies in which almost all of the firms provide training, (especially in the case of on-the-job training) some measure other than incidence is needed. Several variables have been used to measure the intensity of firm training (cf. Frazis et al., 2000; Lynch and Black, 1995; Baldwin and Johnson, 1995). Such variables include the number of hours of training supported, amounts spent on training, number of workers trained, proportion of workers trained, etc. In light of the low response rate to questions on training spending, we chose to build our model around the proportion of workers trained. This variable has the advantage of giving us (1) a measure of the size of the training investment (all things being equal, the higher the proportion of employees trained, the greater the spending on training) and (2) a measure of the access to training (the lower the proportion of employees trained, the more limited the access).

## 5.1 Econometric model

To estimate the determinants of training intensity, we use a linear regression model corrected for selection bias (Heckman two-step method). The correction for selection bias is needed to take into account the bias attributable to the fact that the sample is restricted to locations that supported training. The first step involves using the findings from the estimation of the bivariate probit model, presented in Section 3, to calculate the inverse of the Mill's ratio for the incidence of classroom training. In the second step, the sample is limited to locations that support classroom training. The dependent variable used is the natural logarithm of the percentage of workers who received classroom training.[22] This step involves estimating a linear regression model by the method of least squares, adding the inverse of the Mill's ratio as an independent variable. The same steps are followed for on-the-job training. Remember that the proportion of

[22] A few firms have a percentage of trained workers higher than 100. Although the questionnaire deals specifically with the number of workers trained, some employers may have reported the number of training activities provided. In order to minimize the impact of these extreme observations, the percentage of workers trained was restricted to 100. We have not taken into account the potential problem of a greater truncation.

employees trained is calculated using the employer and not the employee data. Employee data could also have been used to calculate a proportion of employees trained among those surveyed. However, since such a calculation would have been subject to a sampling bias for certain locations, such as locations of more than 500 employees where only 10 employees were surveyed, we preferred to use the employer data. The model is defined as follows:

The first part is the location's decision to offer or not to offer training. As in the previous section:

(5) $Y_{1i}^{*} = \beta_{1i} X_i + \varepsilon_{1i}$

(6) $Y_{1i} = 1$ if $Y_{1i}^{*} > 0$, $Y_{1i} = 0$ otherwise.

The second part is the estimation of the determinants of the proportion of employees trained, $Y_{2i}$, with $Z_i$ as the independent variables:

(7) $\ln(Y_{2i}) = \beta_{2i} Z_i + \varepsilon_{2i}$;

(8) $Y_{2i}$ is observed if $Y_{1i} = 1$.

This model is estimated separately for classroom training and for on-the-job training. As in Section 3, we use the same independent variables for both types of training. The impact of these variables, $\beta$, on the likelihood of offering training or not can vary, however, by training type. Note that the use of the "seemingly unrelated regression model" method to correlate the equation for classroom training to that for on-the-job training is not useful in this instance. In fact, because we used the same independent variables in both equations, the results would have been the same. Since the results of the first step were presented in Section 3, we will concentrate on the results of the second step.

## 5.2 Independent variables

To examine the determinants of the percentage of workers trained, we use the same series of independent variables that were used in modelling the incidence of training in Section 3. However, we will add a new binary variable that takes into account the participation in programs established by the government to ease the budgetary constraints of firms interested in training their workers. This variable could not be used in the incidence model because, by definition, all

of the firms that took advantage of a government program supported training.[23] Expectations regarding the independent variables are virtually the same as those discussed in Section 4.

## 5.3 Findings

Table 5 contains the descriptive statistics for the variables used and Table 7 contains the results of the estimation. The analysis of training intensity produces similar results to those obtained for the analysis of incidence in Section 3, except for those relating to the size of the location.

Locations that have innovated or installed new software or new technologies train a larger proportion of workers on the job. The introduction of new software and new technologies also has a positive impact on the proportion of workers given classroom training. Business strategies play an important role in the case of classroom training since locations train a larger proportion of workers through classroom training when they adopt a wide variety of business strategies, in comparison to location with few or no strategies.

The most striking result is the one related to the size of the location. In contrast to the findings for training incidence, the size of the location appears to have a negative effect on the proportion of employees trained. The fact that size of location has a strong positive impact on the probability that the location sponsors training may mean that fixed costs are an impediment more difficult to overcome for smaller locations. With smaller number of employees, by definition, the average cost of training might be too high in small locations to permit sponsoring of training, given more limited access to financing. However, if this impediment is overcome, small establishments appear to train a higher proportion of their employees, possibly because they wish to divide fixed costs between as many employees as possible. Also, when they are part of a "multi-location," employers train a larger proportion of workers through on-the-job training.

[23] It is important to point out that the WES does not include any questions on access to these government programs, a variable that might have been useful in analysing the incidence of training.

Table 7 **Determinants of the intensity of training, employer survey, estimation by a linear regression corrected for selection bias**

| | | Classroom training | | On-the-job training | |
|---|---|---|---|---|---|
| | | *Coeff.* | *Pr.>Chi2* | *Coeff.* | *Pr.>Chi2* |
| **Competitive and strategic variables** | | | | | |
| *Innovation* | Introduction or improvement of goods or services / processes | 0.061 | 0.375 | 0.116 | 0.045 |
| *Technology* | Installation of new software / technologies | 0.239 | 0.001 | 0.216 | 0.000 |
| *Business strategies* | All strategies except R&D | -0.109 | 0.380 | -0.101 | 0.287 |
| | R&D strategies only | -0.026 | 0.816 | 0.032 | 0.679 |
| | Cost reduction strategies only | -0.422 | 0.018 | -0.154 | 0.125 |
| | No strategy | -0.427 | 0.028 | -0.273 | 0.092 |
| | All strategies | Base | Base | Base | Base |
| *Non-profit* | Location is non-profit | 0.025 | 0.853 | -0.017 | 0.872 |
| *Sales market* | Sells mostly in local market | Base | Base | Base | Base |
| | Sells mostly in Canadian market | 0.081 | 0.312 | 0.060 | 0.404 |
| | Sells mostly in international market | 0.026 | 0.862 | 0.170 | 0.067 |
| *Number of competitors* | No competitor | 0.054 | 0.569 | -0.011 | 0.898 |
| | Between 1 and 5 competitors | 0.068 | 0.453 | -0.140 | 0.038 |
| | Between 6 and 20 competitors | 0.002 | 0.987 | -0.030 | 0.658 |
| | More than 20 competitors | Base | Base | Base | Base |
| **Structural variables** | | | | | |
| *Size* | Ln (number of employees) | -0.123 | 0.003 | -0.168 | 0.000 |
| *Multi-location* | Belongs to a multi-location | 0.374 | 0.000 | 0.182 | 0.004 |
| *Industry* | Natural resources exploitation | 0.649 | 0.000 | -0.120 | 0.415 |
| | Manufacturing | -0.132 | 0.334 | -0.221 | 0.009 |
| | Construction | 0.266 | 0.081 | -0.090 | 0.414 |
| | Transportation, storage, wholesale trade | 0.207 | 0.135 | -0.150 | 0.099 |
| | Communication and other utilities | 0.326 | 0.029 | -0.038 | 0.705 |
| | Retail trade and commercial services | Base | Base | Base | Base |
| | Finance and insurance | 0.547 | 0.002 | 0.075 | 0.455 |
| | Real estate, rental, leasing operations | 0.462 | 0.002 | -0.019 | 0.867 |
| | Business services | 0.233 | 0.122 | -0.096 | 0.361 |
| | Education and health services | 0.617 | 0.001 | -0.036 | 0.742 |
| | Information and cultural industries | 0.082 | 0.608 | -0.080 | 0.429 |
| *Region* | Atlantic | -0.146 | 0.251 | 0.248 | 0.026 |
| | Quebec | Base | Base | Base | Base |
| | Ontario | -0.055 | 0.658 | 0.329 | 0.011 |
| | Prairies | 0.052 | 0.665 | 0.403 | 0.001 |
| | British-Columbia | -0.050 | 0.680 | 0.252 | 0.075 |
| *Quebec Training Act* | Location subject to the Quebec Act | 0.068 | 0.673 | 0.207 | 0.154 |
| *Government* | Use of government assistance for training | 0.017 | 0.859 | 0.176 | 0.002 |
| *Unionization* | No employees covered by a collective agreement | Base | Base | Base | Base |
| | At least one employee covered / no training agreement | 0.051 | 0.671 | -0.005 | 0.976 |
| | At least one employee covered / training agreements | 0.419 | 0.000 | 0.172 | 0.046 |

**Table 7** (continued)

| | | Classroom training | | On-the-job training | |
|---|---|---|---|---|---|
| | | *Coeff.* | *Pr.>Chi2* | *Coeff.* | *Pr.>Chi2* |
| **Workforce characteristics** | | | | | |
| *Payroll* | Ln (payroll per employee) | 0.083 | 0.251 | 0.020 | 0.690 |
| *Non-standard jobs* | Percentage of non-standard jobs | 0.048 | 0.755 | 0.207 | 0.023 |
| *Turnover rate* | Turnover rate | 0.056 | 0.011 | 0.094 | 0.000 |
| | Turnover rate squared | -0.001 | 0.048 | -0.001 | 0.000 |
| *Vacant positions* | Percentage of vacant positions | 2.938 | 0.005 | 1.693 | 0.028 |
| | Percentage of vacant positions squared | -5.648 | 0.006 | -2.273 | 0.118 |
| *Occupational distribution* | Percentage of managers | -0.179 | 0.320 | -0.184 | 0.234 |
| | Percentage of professionals | Base | Base | Base | Base |
| | Percentage of technical / trades workers | -0.443 | 0.009 | -0.060 | 0.673 |
| | Percentage of marketing / sales workers | -0.207 | 0.375 | 0.388 | 0.011 |
| | Percentage of administrative personnel | -0.729 | 0.000 | -0.093 | 0.515 |
| | Percentage of unskilled production workers | -0.693 | 0.000 | 0.033 | 0.801 |
| | Percentage of "other" workers | -0.504 | 0.012 | 0.074 | 0.616 |
| *Correction for selection bias* | Inverse of Mill's ratio | 0.621 | 0.002 | 0.456 | 0.041 |
| *Constant* | | 2.733 | 0.001 | 3.290 | 0.000 |
| $R^2$ | | 0.2371 | | 0.2206 | |
| *Sample size* | | 3,743 | | 4,145 | |

Belonging to almost any other industry grouping has a positive impact on the proportion of employees trained (for classroom training), relative to the comparison group (retail sales and commercial services), with the natural resources exploitation, education and heath services, and finance and insurance sectors being the most likely to train a high proportion of workers. Thus, workers employed in these locations have a better chance of being trained not only because their employer is more likely to support classroom training, but also because they train a larger proportion of their workforce. Locations operating in the manufacturing sector train a smaller proportion of workers through on-the-job training than those in the retail sector, all other things being equal.

All regional variables show an estimated positive and significant coefficient relative to Quebec, but for on-the-job training only. However, locations subject to the Quebec training Act could be more likely to train a larger proportion of workers on the job than those not affected by the Act (the coefficient of this variable is only significant at the 15% level). Using government training programs also has a positive impact but only on the proportion of employees trained on the job. Thus, these programs appear to reduce inequalities in terms of worker access to training.

The negotiation of training agreements appears to be a major factor for unionized employees. Locations with at least one employee covered by a collective agreement and with an education and training agreement train a larger proportion of employees using classroom training than locations where unionized workers are not covered by an agreement.

Turnover rate and the proportion of vacant positions have a positive, yet decreasing impact on the intensity of on-the-job training. A surprising fact is that the proportion of non-standard jobs has a significant positive impact on the intensity of on-the-job training although it has no significant impact on classroom training. It is possible that locations with a large proportion of non-standard workers direct their training efforts toward on-the-job training as this may be a less costly and more appropriate mechanism for training these workers than classroom training.

The occupational group variables reveal that locations with a high proportion of technicians, administrative personnel, unskilled workers and "other" workers train a smaller proportion of workers through classroom training than locations with a high proportion of professionals. On-the-job training appears to be an important tool for sales staff since locations with a high proportion of these employees train a greater proportion of workers compared to those with a high proportion of professionals. Baldwin and Johnson (1995) also show that more professionals receive classroom training than other workers do, while informal training is more common among sales staff and technical personnel.

# 6. Determinants of worker participation in training

Numerous studies have looked at the determinants of the rate of employee participation in training. One limitation of previous studies is that it was not possible to effectively isolate the impact of the characteristics of the firm in which the trained employees work. As a result, it was difficult to determine the impact specific to the characteristics of the workers. For example, some workers (professionals, workers with more experience, etc.) may be more likely to find employment in a training firm that supplies training. Since the WES links employees to their employers, it is possible to take into account the fact that workers are employed in a location that does or does not support training.

## 6.1 Econometric model

In our multivariate analysis, we use a sample composed of 23,540 workers who completed the employee questionnaire. The determinants of training incidence (classroom and on-the-job) for the employee sample are estimated using the bivariate probit model. The structure of this model is the same as that described in Section 3 for the determinants of the incidence of training among employers. In this instance, the decision to take classroom training and that to take on-the-job training may be correlated for different reasons. As was the case with the employer, this correlation can be positive if complementarity links exist between the two decisions reflecting, for example, a common decision to invest in human capital. On the other hand, this correlation can be negative if the two types of training are substitutes instead, representing different means of facilitating the acquisition of similar knowledge. The advantage of this model is that it can take into account the fact that workers may take both classroom training and on-the-job training or only one or the other.

In relation to the econometric model in Section 4, the index *i* of the variables in this model covers employees and not employers. Since several workers were selected in each of the locations, the observations are dependent within a single location, but independent between locations. This problem biases the variance estimators of the estimated coefficients. We correct this bias by using a Huber/White-type variance estimator.[24]

[24] An estimation using a panel approach with random effect may have been considered to evaluate the impact of "location". However, such an estimation is not trivial in the context of a bivariate probit. Using location variables is a simple but incomplete solution because it does not account for all of the possible individual effects.

## 6.2 Independent variables

Decisions to invest in training are complicated by the fact that they involve two agents, the firm and the worker. For supported training to be followed, it needs to have been accepted by both the employee and the employer but either party may have initiated it. The firm may choose to select the employees that it wants to train and employees may also take the initiative to request training. Taking training is therefore the result of a complex decision for which it is difficult to define a model. We use the characteristics of the worker, as well as those of the location in which the employee works. The workers' characteristics will reveal their demand and may also affect the potential selection made by the employer. The characteristics of the location will translate the impact of the employer's supply.

Worker mobility can be costly for firms that have funded training for their workers. In particular, in the case of so-called "general" or "transferable" training, firms that do not fund training are able to offer higher wages than those offered by training firms. Employees perceived as having a weak attachment to the location will be less likely to take training supported by the employer because the latter will be less inclined to agree to support such training (Royalty, 1996). The number of hours worked, employment status and tenure are the variables used to capture this relationship. The square of the number of hours worked is also used to take into account possible time constraints limiting participation in training.

Human capital can be acquired at all stages of a worker's career. However, to maximize the period during which firms and workers can realize returns on training, it is expected that a good part of this acquisition will occur early in a worker's career. The age of the worker is included to take this effect into account.

There are two types of relationships between level of education and the training taken. Initial education (measured, for example, by level of education) is a complement to subsequent training when the basic knowledge acquired through initial education makes it easier to learn more specialized knowledge. Training can also be a substitute for initial education when the knowledge acquired is relatively the same. If training and education produce similar qualifications and the return on these qualifications is decreasing, we should see a higher rate of return on training for less educated individuals. This effect would be reinforced by the fact that

less educated workers generally have a lower opportunity cost. However, if training and education are two forms of complementary investment, the return on training for an educated worker will be higher than for a less educated worker. From a demand standpoint, a higher level of education may also mean a greater desire or greater interest in acquiring new knowledge. In order to capture these effects, we use binary variables indicating the highest level of education achieved by the employee.

Several studies that used employee surveys found that training participation rates varied by occupation. These results could have arisen because of the different propensities of workers to take training, and also to the different probabilities of working in a firm that supports training. Binary variables are used for each occupation, omitting the "professional" group.

Other worker characteristics, such as coverage by a collective agreement and gender, are also included as variables. We used a binary variable to indicate whether the worker uses a computer at work. This variable takes into account the fact that workers who use computers are more likely to take training, especially training related to software (one of the training categories covered by the WES).

Three possible scenarios were envisaged to take into account the fact that some employees do not take training because they do not have access to it. First, we used the same independent variables as for the employer incidence model described in Section 3. A more efficient option is to model access to training by introducing a dichotomous variable that takes the value of 1 if the location offers training and 0 if it does not. However, this variable can be strongly correlated with the residuals. We therefore reworked this variable by building an auxiliary binary variable using the probability predicted by the bivariate probit model for the employer described in Section 3. This auxiliary variable is less likely to be strongly correlated with the residuals. The binary value takes the value of 1 if the predicted probability of supporting training is greater than 0.5 and 0 otherwise. We added variables related to size, industry and region to capture additional effects that are not related to the likelihood that the employer supports training. For example, these additional effects could be the ones that impact the intensity of training, which is the model presented in Section 4. We present only the results from the model with the auxiliary variable.

Note that the introduction of an auxiliary variable "offer of training by the employer" into the demand for training is a relatively simplified approach. More complex models, and therefore ones that are more difficult to estimate, would be needed to clarify the interaction between supply of and demand for training and could be the subject of future research. However, the use of this variable enables us to quantify the impact of access to training on the participation of workers and to control this aspect in the analysis of the other variables.

## 6.3 Findings

The descriptive statistics of the variables used are presented in Table 8 and the estimation findings in tables 9a and 9b. As for the incidence of participation in training by employers, Table 9b presents predicted probabilities for some of the continuous independent variables, for clarity of exposition. We first estimated a bivariate probit model. Because the coefficient of correlation between the two equations was not significant, we then estimated two separate probit equations.[25] Thus, the probability of taking classroom training does not appear to influence the probability of taking on-the-job training in the same period and vice versa. With respect to on-the-job training, we note that, compared with classroom training, very few employee characteristics appear to influence the likelihood of taking this type of training. This finding is also reflected in the descriptive statistics since the differences in participation rates for the various characteristics are smaller in the case of on-the-job training than for classroom training.

Similar to the relationship obtained for employers between participation in training and use of technologies, we found that using a computer is positively associated with employee participation in training, the probability of participating in each type of training increasing by ten percentage points.

[25] Here, we were able to use Stata software commands that enables one to take into account the effects of stratification. However, differences in variances are marginal (they affect the third or fourth decimal).

Table 8 **Descriptive statistics of variables used in the regression model for employees**

| **Dependent variables** | | **Mean** | **Standard deviation** |
|---|---|---|---|
| *Incidence – Classroom training* | | 0.369 | - |
| *Incidence – On-the-job training* | | 0.299 | - |
| **Independent variables** | | | |
| ***Employee characteristics*** | | | |
| *Computer use* | Uses computer at work | 0.608 | - |
| *Occupation* | Managers | 0.151 | - |
| | Professionals | 0.161 | - |
| | Technical / trades worker | 0.390 | - |
| | Marketing / sales worker | 0.084 | - |
| | Clerical / Administrative worker | 0.140 | - |
| | Unskilled production worker | 0.074 | - |
| *Employee status* | Permanent employee | 0.904 | - |
| *Level of education completed* | No secondary diploma | 0.117 | - |
| | Secondary school diploma | 0.197 | - |
| | Certificate | 0.109 | - |
| | College diploma | 0.285 | - |
| | University degree | 0.292 | - |
| *Tenure with employer* | Tenure | 8.444 | 0.145 |
| | Tenure squared | 138.081 | 3.911 |
| *Age* | Age | 39.618 | 0.199 |
| | Age squared | 1692.141 | 15.660 |
| *Number of hours worked* | Number of hours worked | 36.623 | 0.192 |
| | Number of hours worked squared | 1437.817 | 13.112 |
| *Gender* | Male | 0.479 | - |
| | Female | 0.521 | - |
| *Collective agreement* | Covered by collective agreement | 0.279 | - |
| ***Employer characteristics*** | | | |
| *Instrument* | Classroom training | 0.694 | - |
| | On-the-job training | 0.847 | - |
| *Size* | Ln (number of employees) | 4.269 | 0.046 |
| | Number of employees | 585.172 | 68.691 |
| *Multi-location* | Belongs to a multi-location | 0.369 | - |
| *Industry* | Natural resources exploitation | 0.017 | - |
| | Manufacturing | 0.171 | - |
| | Construction | 0.039 | - |
| | Transportation. storage. wholesale trade | 0.103 | - |
| | Communication and other utilities | 0.023 | - |
| | Retail trade and commercial services | 0.240 | - |
| | Finance and insurance | 0.047 | - |
| | Real estate. rental. leasing operations | 0.017 | - |
| | Business services | 0.093 | - |
| | Education and health services | 0.217 | - |
| | Information and cultural industries | 0.033 | - |
| *Region* | Atlantic | 0.066 | - |
| | Quebec | 0.238 | - |
| | Ontario | 0.399 | - |
| | Prairies | 0.171 | - |
| | British-Columbia | 0.126 | - |
| *Quebec Training Act* | Location subject to the Quebec Act | 0.193 | - |

Note: Sample weights were used. The size of the sample is 23,540 employees. Standard deviations are calculated taking into account the heterogeneity of the observations as well as stratification.

Table 9a **Determinants of the incidence of training, employee survey, estimations by probit, marginal effects**

| | | Classroom training | | On-the-job training | |
|---|---|---|---|---|---|
| | | *Marginal effect* | *Pr.>Chi2* | *Marginal effect* | *Pr.>Chi2* |
| ***Employee characteristics*** | | | | | |
| *Computer use* | Uses computer at work | 0.106 | 0.000 | 0.094 | 0.000 |
| *Occupation* | Managers | 0.000 | 0.994 | -0.011 | 0.699 |
| | Professionals | Base | Base | Base | Base |
| | Technical / trades worker | -0.034 | 0.173 | -0.018 | 0.395 |
| | Marketing / sales worker | -0.096 | 0.043 | -0.040 | 0.285 |
| | Clerical / Administrative worker | -0.147 | 0.000 | 0.001 | 0.960 |
| | Unskilled production worker | -0.109 | 0.015 | 0.017 | 0.655 |
| *Employee status* | Permanent employee | 0.086 | 0.005 | 0.052 | 0.034 |
| *Level of education completed* | No secondary diploma | Base | Base | Base | Base |
| | Secondary school diploma | 0.013 | 0.688 | 0.020 | 0.424 |
| | Certificate | 0.099 | 0.007 | 0.023 | 0.415 |
| | College diploma | 0.073 | 0.024 | 0.038 | 0.124 |
| | University degree | 0.115 | 0.001 | 0.022 | 0.397 |
| *Tenure with employer* | Tenure | 0.003 | 0.246 | -0.011 | 0.000 |
| | Tenure squared | -0.002 | 0.054 | 0.027 | 0.001 |
| *Age* | Age | 0.001 | 0.001 | -0.003 | 0.548 |
| | Age squared | -0.003 | 0.001 | -0.000 | 0.945 |
| *Number of hours worked* | Number of hours worked | 0.009 | 0.007 | -0.003 | 0.216 |
| | Number of hours worked squared | -0.010 | 0.009 | 0.003 | 0.337 |
| *Gender* | Male | -0.026 | 0.146 | -0.013 | 0.372 |
| *Collective agreement* | Covered by collective agreement | 0.008 | 0.670 | 0.036 | 0.060 |
| ***Employer characteristics*** | | | | | |
| *Instrument* | Classroom training | 0.114 | 0.000 | 0.037 | 0.164 |
| | On-the-job training | 0.024 | 0.455 | 0.060 | 0.021 |
| *Size* | Ln (number of employees) | 0.019 | 0.001 | 0.006 | 0.273 |
| *Multi-location* | Belongs to a multi-location | 0.064 | 0.001 | 0.044 | 0.010 |
| *Industry* | Natural resources exploitation | 0.119 | 0.007 | 0.007 | 0.087 |
| | Manufacturing | 0.016 | 0.588 | 0.019 | 0.541 |
| | Construction | 0.077 | 0.060 | 0.036 | 0.370 |
| | Transportation, storage, wholesale trade | 0.106 | 0.003 | -0.005 | 0.889 |
| | Communication and other utilities | 0.152 | 0.000 | -0.001 | 0.975 |
| | Retail trade and commercial services | Base | Base | Base | Base |
| | Finance and insurance | 0.227 | 0.000 | 0.089 | 0.011 |
| | Real estate, rental, leasing operations | 0.062 | 0.126 | -0.068 | 0.079 |
| | Business services | 0.099 | 0.014 | -0.031 | 0.340 |
| | Education and health services | 0.087 | 0.023 | -0.006 | 0.865 |
| | Information and cultural industries | 0.001 | 0.978 | -0.046 | 0.206 |
| *Region* | Atlantic | -0.034 | 0.477 | 0.154 | 0.000 |
| | Quebec | Base | Base | Base | Base |
| | Ontario | 0.002 | 0.974 | 0.188 | 0.000 |
| | Prairies | -0.027 | 0.571 | 0.198 | 0.000 |
| | British-Columbia | -0.083 | 0.086 | 0.170 | 0.000 |
| *Quebec Training Act* | Location subject to the Quebec Act | -0.025 | 0.620 | 0.055 | 0.198 |

Note: The marginal effect represents the change in the model's predicted probability that the location is sponsoring training (classroom or on-the-job): for dichotomous variables, it is the change in the predicted probability when switching from the base group to a particular group. For continuous variables, it is the effect of a marginal change, calculated at the mean (see also table 9b for continuous variables).

Table 9b **Determinants of the incidence of training, employee survey, predicted probabilities[1] for continuous variables at different values**

| Variables | Value | Predicted probability (%) | |
|---|---|---|---|
| | | Classroom training | On-the-job training |
| Tenure with employer [2] | 1 year | 34.9 ns | 33.1 |
| | 5 years | 35.8 ns | 29.2 |
| | **Mean (=8.4 years)** | **35.0 ns** | **28.5** |
| | 20 years | 34.3 ns | 23.0 |
| Age [2] | 20 years old | 35.8 | 34.5 ns |
| | 30 years old | 35.8 | 31.4 ns |
| | **Mean (=39.6 years old)** | **35.0** | **28.5 ns** |
| | 55 years old | 33.5 | 24.0 ns |
| Hours worked / week [2] | 20 hours | 30.3 | 30.3 ns |
| | 30 hours | 34.3 | 28.8 ns |
| | **Mean (=36.6 hours)** | **35.0** | **28.5 ns** |
| | 50 hours | 36.5 | 27.7 ns |
| Number of employees | 5 employees | 30.1 | 27.0 ns |
| | 15 employees | 32.0 | 27.6 ns |
| | **Mean (=71.4 employees)** | **35.0** | **28.5 ns** |
| | 500 employees | 38.8 | 29.6 ns |

ns: The marginal effect of this variable on the probability of supporting classroom or on-the-job training is not significant at the 10% level

1 Predicted probabilities are calculated by setting the chosen variables to specific values, while the other independent variables of the model are set to their mean values.

2 We also set the square of this variable to its corresponding value.

Occupation appears to have a significant impact on the probability of taking classroom training, but not much on the probability of taking on-the-job training. The various categories of workers (except managers) are less likely than professionals to take classroom training. Thus, professionals not only have better access to training but they are also more inclined to take it, if available.

Permanent workers are more likely than non-permanent workers to take classroom training (of around nine percentage points) and on-the-job training (five percentage points). Since firms are less likely to recover their investment in training for temporary workers, they will be less inclined to support training for these workers (especially the most costly training). Temporary workers may also be less interested in investing time in training if they see few benefits in it.

Further, participation in classroom training increases with level of education, these two forms of investment appearing to be complementary. However, this effect appears to be limited to post-secondary education since the effect of a high school diploma (compared with no high

school diploma) is not significant. Having a university diploma increases the probability of taking classroom training by 12 percentage points. Note that Lowenstein and Spletzer (1994) also demonstrated that more educated workers have a greater probability of taking formal training but are less likely to take informal training. Betcherman et al. (1997), on the other hand, reported the opposite finding regarding informal training: workers with a high level of education were more inclined to take informal training than less educated workers. Our analysis shows that the probability of taking on-the-job training does not appear to be substantially affected by the level of education. One possible explanation of this phenomenon is that this type of training is more useful at the beginning of employment in order to assimilate the characteristics inherent to the work performed, and that this applies to all workers regardless of level of education. This is confirmed by the fact that the tenure variable has a negative effect on the likelihood of taking on-the-job training. Our analysis shows that the probability of taking training peaks at the age of 25, and then declines very slightly with age. The effect of age on the predicted probability of taking on-the-job training seems to be negative, but is not significant.

The incidence of classroom training increases with the number of hours worked. Thus a part-time employee is less likely to take classroom training than a full-time employee. However, the number of hours worked may become a constraint when the number of hours is especially high, as reflected by the fact that the probability of taking classroom training grows at a decreasing rate with hours worked. For example, an individual has a probability of taking classroom training of 30% if working 20 hours a week, of 35% if working an average number of hours (approximately 37) and of 37% if working 50 hours a week. The number of hours worked has an insignificant negative effect on the probability of taking on-the-job training.

As for gender differences, the OECD (1999), based on a comparison of various international surveys, found that women tended to receive more formal training, while men received more informal training. Our analysis prevents us from commenting on this finding, since the results were not significant at the 10% level. However, the sign of the estimated coefficient suggests a similar effect for classroom training.

Finally, being covered by a collective agreement doesn't have a significant effect on the probability of taking classroom training and has a small positive and significant effect at the 10% level on the probability of taking on-the-job training.

The characteristics of the location in which a worker is employed also play a major role in the probability of taking training. As expected, the probability that the employer supports classroom training (i.e., access to classroom training) has a substantial impact and positively affects the likelihood of taking classroom training. The findings are the same for on-the-job training. Contrary to the findings generally reported in household surveys, the variable of location size does not seem to have a great impact on the probability of taking training. For example, an individual working in a location with five employees has a 30% probability of taking classroom training, compared to 39% for a worker in a location with 500 employees. These differences are far smaller than in the model of employer participation in training. Thus, workers in small locations are mainly disadvantaged by less access to training (effect captured by the instruments), rather than by lower participation.[26] On the other hand, working in a multi-location increases participation in training (by approximately five percentage points). Certain industry and region variables are also significant. The findings obtained for size, industry and region are similar to those obtained in the intensity model.

[26] A number of other econometric specifications were also done (available on request). In particular, we used the employee and employer variables by excluding the instrument. The findings remained relatively the same. However, by adding the instrument, thereby capturing access to training, the impact of the location's size on participation in classroom and on-the-job training was no longer significant.

# 7. Conclusions

The WES database contains information on both employers and employees. However, our results do not generally differ from thoseobtained in the analysis of the determinants of training with household surveys, such as the fact that workers with higher educational attainment are more likely to take training. Our analysis also confirms results coming from employer-based surveys, like the strong correlation between training and innovation or the implementation of new technologies. Nevertheless, we bring some new elements to the analysis of the determinants of training.

First, we compare findings for classroom training with those for on-the-job training. Previous studies have shown that some groups of firms (small firms, for example) and workers (for example, young workers, with few diplomas, holding non-standard jobs) were less likely to participate in classroom training. Some had raised the fact that the latter could compensate for their low participation rate in classroom training with greater participation in on-the-job training. Our study shows that this is not the case. However, since there is little difference between participation in on-the-job training and in classroom training based on the various characteristics of workers and employers, taking on-the-job training into account makes it possible to reduce the differences in participation between the various groups of workers and locations.

Also, the fact that the survey comprises a questionnaire for the employer and another for the employee enables us to identify two groups of non-participants. Although 84% of employees work in firms supporting one form of training or the other, only 55% have taken training. Thus, 29% of workers potentially have access to training but do not take it either because of a lack of demand or because of employer selection. For example, if the return on training increases with level of education achieved, then the employer may decide to support training for the most educated workers only or the most educated workers may be more inclined to ask for training support. In addition, 16% of workers do not have access to training because it is not offered by the employer.

Another distinction from our analysis is the fact that, even though small locations are far less likely to offer training to their employees, those small locations that decide to do so train a slightly higher proportion of employees than larger locations. These results seem to indicate that

the fixed costs (rental of facilities, hiring of instructors, etc.) of supporting training are a greater barrier than the variable costs for small locations. Consequently, policies and programs to assist SMEs overcoming problems (financial, organizational, etc.) related to their size might help stimulate participation in training by these locations.

At the level of employee characteristics influencing participation in training, another departure from other studies is that age doesn't seem to have a great impact on training participation. Further, the link between training and innovation or technology as seen on the employer side is reflected in the employee characteristics that influence training participation. Thus, employees using a computer at work are more likely to take training.

As a result of our study, a number of avenues of research warrant further exploration. To begin with, a sensitivity analysis could be undertaken by re-estimating separate equations by location size or industry, in order to ensure that the results obtained (for example, the positive relationship between innovation and training) hold for all industries and firm sizes.

Another type of extension would involve examining the link between training and other variables in the WES, such as human resources practices variables. As examples, some studies (Lynch & Black, 1995; Frazis et al., 1998; Osterman, 1995) have analysed these links. These studies have found that firms using so-called "highly effective" work practices and which provide fringe benefits to their employees are more likely to offer their employees training. Adding these variables is justified by the fact that providing training may be related to other practices seeking to reduce worker's turnover rate. The decision to provide training may also be part of a series of practices adopted to make the firm more competitive. Studies (Ichniowski et al., 1990) have shown that firms were more likely to combine human resource management practices to take advantage of the synergy between practices. It would therefore be possible to use the WES questions on the use of these so-called "highly effective" practices and the degree of participation of employees in them, these practices potentially requiring an adjustment in knowledge in order to participate in them. The WES also covers compensation practices, such as merit and skills-based pay, which may complement training practices and could be considered in future research.

# Appendix A

Extract from WES questionnaires

## A1.1 Employer questionnaire: extract from training and development section

This section covers the nature and extent of workplace training. It is meant to include all types of training intended to develop your employees' skills and/or knowledge through a structured format (Question 14(a)) or on-the-job training (Question 16(c)) whether it takes place inside or outside the location.

**14 a)** *Between April 1, 1998 and March 31, 1999*, did this workplace pay for or provide any of the following types of classroom job-related training?

Classroom training includes:

- all training activities which have a predetermined format, including a pre-defined objective;
- specific content;
- progress may be monitored and/or evaluated.

01 ○ No classroom training ⟶ Go to Question 16(a)
02 ○ Orientation for new employees
03 ○ Managerial/supervisory training
04 ○ Professional training
05 ○ Apprenticeship training
06 ○ Sales and marketing training
07 ○ Computers/hardware
08 ○ Computer/software
09 ○ Other office and non-office equipment
10 ○ Group decision-making or problem-solving
11 ○ Team-building, leadership, communication
12 ○ Occupational health and safety, environmental protection
13 ○ Literacy and numeracy
14 ○ Other training, specify _____

**14 b)** Please estimate the number of employees who received classroom training between April 1, 1998 and March 31, 1999. (include full-time, part-time, permanent and temporary employees.)

[_][_][_][_][_]

**16 c)** Between April 1, 1998 and March 31, 1999, did this workplace pay for or provide any of the following types of on-the-job training?

01 ○ No on-the-job training ⟶ Go to Question 17.
02 ○ Orientation for new employees
03 ○ Managerial/supervisory training
04 ○ Professional training
05 ○ Apprenticeship training
06 ○ Sales and marketing training
07 ○ Computers/hardware
08 ○ Computers/software
09 ○ Other office and non-office equipment
10 ○ Group decision-making or problem-solving
11 ○ Team-building, leadership, communication
12 ○ Occupational health and safety, environmental protection
13 ○ Literacy or numeracy
14 ○ Other training, specify _____

**16 d)** Please estimate the number of employees who received on-the-job training between April 1, 1998 and March 31, 1999. (Include full-time, part-time, permanent and temporary employees.)

[_][_][_][_][_]

## A1.2 Employee questionnaire: extract from training and development section

The next few questions deal with job-related training provided or paid by your employer.

**25.** In the past twelve months, have you received any classroom training related to your job?

1 ○ Yes ⟶ Go to Question 25(a)
3 ○ No ⟶ Go to Question 25(d)

Classroom training includes:

- All training activities which have a predetermined format, including a pre-defined objective
- Specific content
- Progress may be monitored and/or evaluated.

**25 d)** In the past twelve months, have you received any informal training related to your job (that is on-the-job training)?

1 ○ Yes

3 ○ No ⟶ Go to Question 26

# Appendix B

## Definition of variables used

**Innovation:** The location introduced, between April 1, 1998 and March 31, 1999, new products/services, improved products/services, new processes or improved processes.

**Largest sales market:** Market accounting for the greatest (%) revenue from sales from among the following markets: local, rest of Canada, international.

**Location covered by a collective agreement:** A location in which at least one employee is covered by a collective agreement.

**Location subject to the Act:** A location in Quebec with a payroll equal to or greater than $250,000.

**Number of competitors:** Number of firms that offer products and services in direct competition with those of the establishment in the largest sales market.

**Payroll:** Total gross remuneration at this location for all employees between April 1, 1998 and March 31, 1999, divided by the size of the location.

**Percentage of non-standard workers:** Number of non-permanent workers and/or part-time workers during the last pay period in March 1999, divided by the size of the location.

**Percentage of workers by occupation:** Number of workers in a given occupation, divided by the total number of employees in the location.

**Percentage of workers trained:** Number of workers trained, divided by the size of the location.

**Percentage of vacant positions:** Number of vacant positions, divided by the size of the location.

**Price level:** Price level of the establishment's products and services in relation to those of the main competitors in the largest sales market.

**Size of the location:** Number of persons employed in the location during the last pay period in March 1999.

**Training agreements:** The agreement with the largest bargaining unit defines how educational studies and training will be dealt with.

**Training supported by the employer:** Training that is provided, funded or assisted by the location.

**Turnover rate:** Total number of hires and permanent departures between April 1, 1998 and March 31, 1999, divided by the average size of the location during this period.

**Use of technology:** Installation of important new software or computer-run or computer-assisted technology between April 1, 1998 and March 31, 1999.

**Use of government grants or programs:** The establishment benefited from government training programs or training grants.

# Appendix C

## Cluster analysis

In order to take into account links existing between support for training and business strategies, we built binary variables indicating the type of strategies adopted by the location (or by the firm to which the location belongs). Locations were required to indicate in the WES the relative importance, on a scale of one to six, of 15 business strategies related to research and development, human resources, product quality and cost reduction.

A number of these strategies can be complementary. For that reason, we used a cluster analysis (cf. Arthur, 1992; Ichniowski, 1990). This analysis divides the locations into several groups so that locations in the same group are as similar as possible and locations between each of the groups are as dissimilar as possible. The objective in this case was to divide the locations into separate groups based on the importance attributed to the 15 strategies. To this end, the FASTCLUS procedure was used in SAS. This procedure assigned a location to a group so that the variation within the group (measured by the square of the Euclidean distance from the group mean) was kept to a minimum and the distance between the groups (i.e., the distance between the mean of the groups) was maximized.

Each of the business strategies variables was standardized to a mean of zero and a standard deviation of one. This method required the number of desired groups to be specified. We ultimately decided on the analysis with five groups as it provided a good basis for explanation and interesting characteristics.[27] The name given to each of the groups reflects the importance attributed to the various business strategies: "Cost reduction strategies only," "All strategies except research and development," "All strategies," "Strategies related to research and development only," and "No strategy".

[27] The results of this analysis are available on request.

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